

# INDIVIDUALIZATION OF INSTRUCTION USING 'SOCRATIVE' APP

Tatiana Prextova, Libor Klubal, Kateřina Kostolányová, Zuzana Homanova and Vojtěch Gybas  
*University of Ostrava, Pedagogical Faculty  
Franti Sramka 3, Ostrava, Czech Republic*

## ABSTRACT

Individualization of instruction in a regular classroom is difficult. The paper explores the possibilities of using a mobile touch device and a web tool for time individualization in mathematics instruction. The paper compares the pros and cons of using an electronic and a regular (printed) test to determine students' needs. The results show that the electronic test is more time-saving than the regular test. Moreover, the paper also describes the use of an electronic test in a classroom.

## KEYWORDS

Individualized Instruction, Mobile Device, Tablet, Socrative, Web Application

## 1. INTRODUCTION

The often used terms Individualized instruction and Individualization are a part of educational policies in a number of countries, including the Czech Republic. Published by the Ministry of Education, School and Sports, the **Framework Education Program for Basic Education** contains the following individualization-related points (2017):

- *"Apply variable organizational patterns and individualization of the learning process respecting students' needs and potential; apply differentiation to education",*
- *"Apply the principle of the differentiation and individualization of the learning process when organizing activities and determining educational content, forms and methods".*

In real instruction, however, the teacher faces the problem of how to individualize instruction in an environment where instead of 6 or 10 students, they have to deal with 25 or 30 students. What methods and technologies can the teacher use to help all of their students fully develop their potential? Is mobile technology essential in implementing individualization into instruction?

The ISTE (International Society for Technology in Education) Standards for teachers and students lead us to the conclusion that the implementation and effective use of technology in the learning process helps students fulfill their potential:

ISTE Standards for Teachers (2017):

- *"Use technology to create, adapt and personalize learning experiences that foster independent learning and accommodate learner differences and needs".*
- *"Design authentic learning activities that align with content area standards and use digital tools and resources to maximize active, deep learning".*
- *"Explore and apply instructional design principles to create innovative digital learning environments that engage and support learning".*

ISTE Standards for Students (2017):

- *"Students articulate and set personal learning goals, develop strategies leveraging technology to achieve them and reflect on the learning process itself to improve learning outcomes".*
- *"Students build networks and customize their learning environments in ways that support the learning process".*

Once every student has a mobile device, individualization of instruction becomes much more feasible.

## 2. INDIVIDUALIZATION

First of all, the term individualization needs to be defined as it is often confused with individual instruction, which is a face-to-face, one teacher-one student type of instruction.

The Pedagogical Dictionary (Průcha, Walterová, Mareš, 2013) defines individualization as *“a way to differentiate instruction where a heterogeneous classroom remains a basic social unit and the inner, content and methodical differentiation takes students’ individual characteristics into account”*. Kargerová and Maňourová (2013) define individualized instruction similarly, arguing that it is an instruction that *“supports collective education of children with different skill levels. We take these differences into account when planning, realizing and evaluating instruction”*.

The teacher should adapt both the content and methodical part of instruction to reflect individual characteristics of their students. The teacher’s role is to help the student maintain their uniqueness and develop their individual skills. Since each student has the same rights, the teacher needs to find methods that will best suit a particular student. Moreover, the teacher should be able to recognize their students’ strengths and assign them such tasks that would allow them to be successful and meet their goals. In quality instruction the teacher should approach their students individually.

### 2.1 Individualization Principles

Individualization in the education process is based on two principles (Kasíková, Dittrich, Valenta, 2007):

#### **Mastered Curriculum Principle**

There are various ways for students to master the curriculum. Even the slower students can master the curriculum as they have more time to solve the problem. However, the teacher also needs to have additional tasks and activities (adapted to their skills and abilities) prepared for the faster students.

#### **Continuous Learning Progress Principle**

Working at their own pace, students should be able to achieve the learning objective in a given time and under the given conditions. In real instruction, the faster students often need to wait for their slower peers and therefore become bored and/or engage in extra-curricular activities. Therefore, the teacher is expected to have additional tasks prepared for the faster students. This way, working at their own pace, each student can work toward the learning objective.

### 2.2 Individualization Types

The following are the types of individualization of instruction, which are based on the principle of individualization of the learning content, teaching methods and strategies and learning pace (Vališová, Kasíková, 2011):

#### **Selection of curriculum parts**

Students can choose anything from the curriculum and focus on e.g. natural sciences, humanities, etc. Moreover, they can also choose a particular subject or a particular part of the subject’s curriculum.

#### **Additional instruction**

It is an instruction where the basic curriculum is taught to all students, with the additional information being provided to those students who are either interested in the topic and would like to know more (additional, in-depth information) or to those who do not understand the basic curriculum and need to explore different learning strategies which would help them understand it.

#### **Student in learning units**

The curriculum is divided into parts, with students being told how to proceed. They proceed individually, choosing the sequence of tasks, their own pace, etc.

#### **Individualization “matching”**

It is matching the teacher’s teaching style with the student’s learning style. For instance, the teacher adapts their teaching strategies to the needs of a particular student.

## 2.3 Individualization Systems

Individualization systems represent different views on and approaches to individualization. The following are the best-known systems (Vališová, Kasíková, 2011):

### 2.3.1 Mastery Learning

This type of learning is based on the assumption that learning and its results are directly related to the amount of time we have for learning. It means that every student can reach a certain level of learning if presented with appropriate conditions, the most of important of which being time and feedback. As a result, the student becomes more motivated to study. The system works as follows: after collective instruction, students are given feedback on if they were able to meet their learning objectives (a formative test is used to acquire the feedback). The students, who have not met the learning objectives and requirements, need to work further.

### 2.3.2 Keller Plan

Even though the system was mainly used in university instruction, its principles could also be used at other levels of education:

- Dividing the study material into smaller learning units.
- The learning pace is individual; it is quality that is important, not time.
- Written study materials (i.e. instruction manuals) are used to guide the student in their learning process.
- For the purposes of discussion within smaller groups of students, a selected student becomes the teacher's helper.
- Instruction is motivational.
- Students are evaluated when they have successfully completed a learning unit.

### 2.3.3 FENI Model

It is a four-level model that is mainly used in the German education system. It consists of the following four levels:

#### **Forderungskurs**

A course that helps the student develop their skills and abilities. It consists of students who are able to deepen their knowledge of the subject matter by using critical and abstract thinking.

#### **Erweiterungskurs**

A course that provides additional information to those students who have no difficulty understanding the basic curriculum.

#### **Normalkurs**

A basic course consisting of students who have difficulty understanding the new curriculum.

#### **Intensivkurs**

A course designed to help the weaker students. It consists of those students who need intensive help from the teacher to master the curriculum.

### 2.3.4 Dalton Plan

This principle is based on self-studying. The student is able to master the curriculum on their own, using their own learning strategies. In this case, the teacher is only a consultant who guides the student. The main objective of this principle is to teach the student to be responsible for their own learning.

## 3. INDIVIDUALIZATION USING MOBILE TECHNOLOGY

### 3.1 Pedagogical Features of Mobile Technology

In 2012, academic scholars from the University of Hull (UK) and the University of Technology (Australia) designed the so-called iPAC Framework which identifies the specific pedagogical features of mobile devices that are used in instruction. The features consist of three main constructs – Personalization, Authenticity and

Collaboration, which are further divided into seven sub-constructs – Customization, Agency, Task, Tool, Setting, Conversation and Data Sharing (see Figure 1):

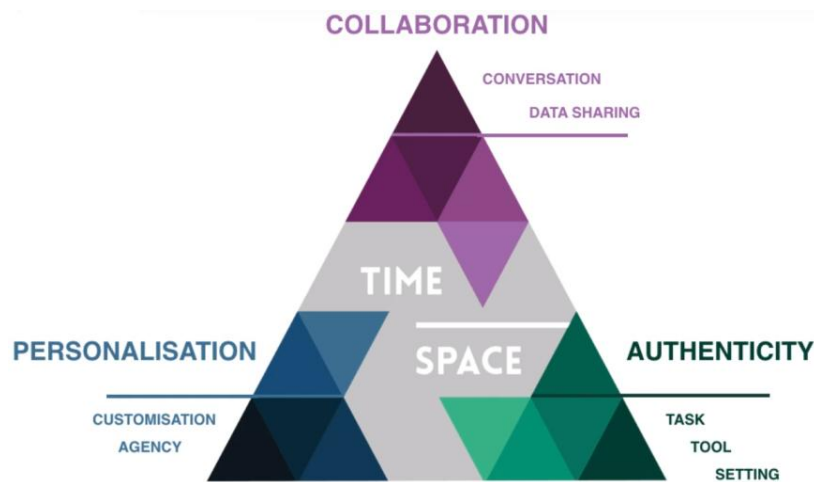


Figure 1. iPAC Constructs (Mobile Learning Toolkit, ???)

### Customization

Mobile learning activities can also be customized or tailored to the needs of individual students, helping to make them more personalized. This often involves designing individual tasks for students and thus enabling them to use the features of their mobile devices, such as apps, to make their learning individual. Mobile devices are becoming context aware, thus making it possible for the device to capture information about the learner such as their location, time and the people/objects that are near them. As a result, students can be presented with additional information, resources and activities on an individual or tailored basis.

### Agency

In well-designed mobile learning activities, students have a high degree of control over the places, pace and time of learning. It also includes the degree to which students have autonomy over what they learn or the learning objectives.

### Task and Tool

Mobile devices enable students to undertake more authentic tasks, using more realistic tools. Students are presented with the kind of activities they might encounter outside of formal learning settings. Moreover, mobile devices also enable students to use a variety of tools and applications that are as realistic as those used by real-world professionals.

### Setting

Setting is closely related to the tasks and tools with which students deal. It refers to the place or space where the mobile learning task is situated. This includes physical settings such as a field trip where students have their mobile device with them to collect and analyze data, or virtual settings such as a video conference with a scientific institution, which allows students to participate in a highly authentic exchange of ideas and information.

### Conversation

Social interaction, conversation or dialogue through mobile technology can be beneficial not only to the student, but also to the teacher. It allows the teacher to provide feedback to their students and students to exchange opinions, ideas and other information.

### Data Sharing

Data sharing is an important part of communication. Using mobile technology, students can create shared, socially interactive environments where they can conveniently communicate—often multi-modally—and exchange information and resources with their peers, teachers and other experts.

### 3.2 Individualization in Mathematics?

The actual instruction process is usually divided into the following stages: motivation – the teacher tries to make the students interested in the curriculum; exposition – the teacher transfers their knowledge to students, creating the foundation for skills and habits; fixation – which consists of repetition and leads to knowledge retention. The fixation methods are divided depending on whether we fixate knowledge or skills. (Klupal et al, 2017)

One of the fixation methods, practice is mainly used in foreign language and mathematics instruction. The repetition of facts leads to knowledge retention (fixation). In mathematics, it is multiplication of single-digit numbers, where discovering that multiplication may be done by addition can turn a skill into knowledge. Knowledge is built through practice, which is sometimes referred to as drill. This enables the student to solve more complex problems and acquire more complex skills. In foreign language instruction, this is represented by building a vocabulary. In foreign language instruction drill is often the main tool for knowledge fixation. (Klupal, Kostolanyova, 2015)

Obtaining feedback is an integral part of repetition/practice. When using non-ICT tools in repetition, feedback usually comes too late, after having been corrected by another person and/or having found the correct answer in the study material. Using ICT-based tools allows for immediate correction of errors and feedback acquisition at the time when the student is still fully focused on the task. The research results prove that electronic repetition is much more effective, especially for those students who have not yet acquired enough knowledge.

### 3.3 Experiment Description

Individualization during the fixation stage is facilitated through adaptation of content to students' current knowledge. As has already been mentioned, individualization of instruction in a regular classroom is difficult. The following paragraphs describe the use of the Socrative app and a mobile touch device to create such classroom conditions which would allow for a sufficient degree of individualization in terms of time management.

25 students (11 and 12 years old) participated in the experiment. The topic was decimal numbers (notation, rounding, addition, subtraction, multiplication and division). The problems used in the electronic test were chosen from a textbook which all students had at their disposal. The objective of the experiment was to determine the impact of the mobile touch device and the web tool on the time management aspect of individualization in a regular classroom, i.e. the time every student needed to understand the curriculum.

First of all, the Socrative system was used to design an electronic test which included three problems from each part of the curriculum. The purpose of the test was to determine areas in which the student needed to improve. Aside from the electronic version of the test, the teacher also had its printed version in which source tasks from the textbook were highlighted, thus allowing them to determine how the tested curriculum is represented in both the textbook and the Socrative app.

Using an iPad, each student logged into the classroom via a QR code. Students had 15 minutes to complete the test (however, they were allowed to complete it before the time limit). The test was preceded by a 3-minute preparation stage, during which the tablets were distributed to students who then logged into the Socrative app. During the pretest, feedback is displayed only to the teacher, students cannot see it.

During testing, the Socrative app displays real-time information, allowing the teacher to monitor each student's progress. Based on their results, the teacher assigned examples from the textbook to the students. All students completed the test before the 15-minute time limit. After the pretest, the teacher launched the same test in the Socrative app. This time, however, the student immediately sees whether their answer is correct or not. Afterward, the students went over the entire test one more time, which allowed them to compare their knowledge at the beginning and end of class.

*****	93%	38,225	1,00026	2,5	0,21	C	1,58	28,845	C	2,22	26,7
*****	79%	38,225	1,00026	2,5	0,00206	C	1,58	28,855	C	2,22	26,7
*****	43%	38,020	1,0026	2,5	0,2	C	1,58	1,451	C	2,22	26,7
*****	21%	38,2265	1,0026	2,600	00,26	C	1,58	26,45	A	2,22	26,7
*****	93%	38,225	1,00026	2,5	0,21	C	1,58	28,845	C	2,22	26,7
*****	43%	38,225	1,261	2,5	0,21	C			C	2,22	26,7
*****	93%	38,225	1,00026	2,5	0,21	C	1,58	28,845	C	2,22	26,7
*****	50%	30,225	1,0026	2,5	0,200	C	1,58	28,251	C	2,22	1,4
*****	50%	38,225	1,00026	2,6	0,2	C	1,58	2,845	C	2,22	26,7
*****	36%	38,025	1,0026	2,540		C			C	2,22	26,7
*****	43%	38,225	1,26 000	2,540	0,300	C	1,58	28,845	C	2,22	26,7
*****	50%	30,24	1,00026	2,530	1,26	C	1,58	28,845	C	2,22	26,7
*****	50%		1,00026	2,6	0,21	C	1,58			2,22	26,7
*****	86%	38,225	1,00026	2,5	0,21	C	1,58	28,845	C	2,22	26,7
*****	57%	38,225	1,26000	2,500	0,210	B	1,58	28,845	C	2,22	26,7
*****	50%	38,0225	1,00026	2,540	0,2	C	1,58	28,845	C	2,22	26,7
*****	86%	38,225	1,00026	2,5	0,21	C	1,58	8,845	C	2,22	16,7
*****	86%	38,225	1,00026	2,5	0,21	C	1,58	27,845	C	2,22	26,7
*****	93%	38,225	1,00026	2,5	0,21	C	1,58	28,845	C	2,22	26,7
*****	71%	38,225	1,00026	25,39	2,06	C	1,58	28,845	C	2,22	26,7
*****	57%	38,225			0,21		1,58	28,845	C	2,22	26,7

Figure 2. Students' Results in Socrative app

The Socrative electronic system enables the teacher to be actively involved in the student's problem-solving process, allowing them to immediately react to any problems. If it is evident that the student has not mastered the basic skills (e.g. the student in Line 10), the teacher can stop the test and make the student practice the curriculum. Moreover, the teacher can also become involved when a student is too slow and requires individual help. If the printed version of the test was used, none of the above would be possible.

Figure 3 shows the results of students in the experimental group.

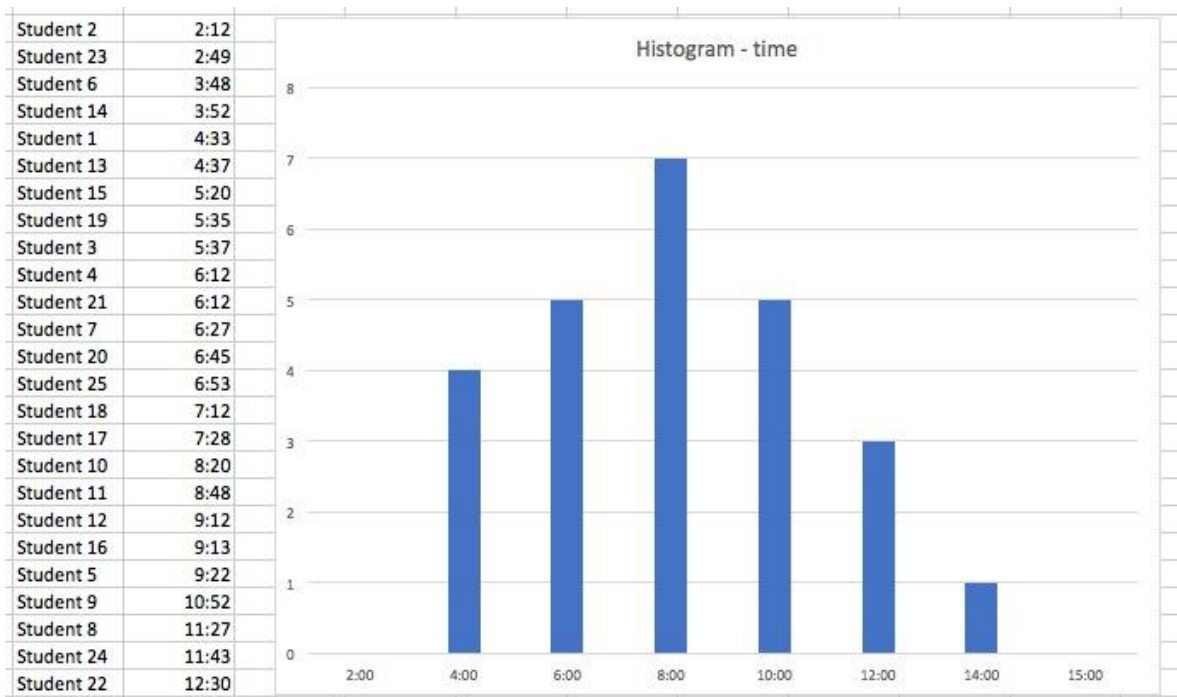


Figure 3. Results of Experimental Group

In the control group, the content of instruction was the same, but the printed version of the test (generated by the Socrative app) was used. The control group was a parallel group with the same number of students. Therefore, both groups were solving the same problems. Test distribution and instruction took as long as in the experimental group. During testing, however, the teacher could not follow the students' progress; they provided the solution key only when a student asked for it or when the teacher found out that the student had completed the test. It took the students 2 to 4 minutes, on average, to go over the test.

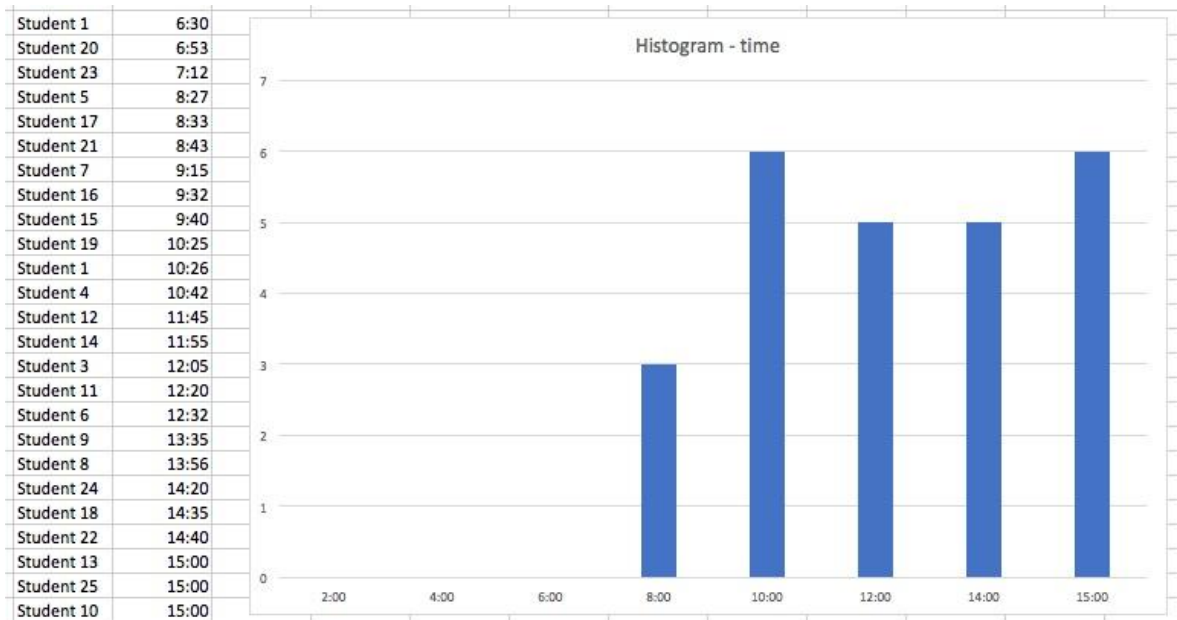


Figure 4. Results of Control Group

Since the teacher needs to grade the test manually and is unable to immediately see the errors, it takes them much longer to determine the current level of students' skills and knowledge.

## 4. CONCLUSION

Using the Socrative app and a mobile touch device makes individualization in a regular classroom with a high number of students much less time-consuming. Being able to follow the student's problem-solving process enables the teacher to address the problems immediately (and not only after the test has been completed). Students are given feedback on the level of their skills and knowledge and thus can spend time on the part of the curriculum that they have not yet mastered. However, the teacher remains the authority figure who can help students decide how to proceed.

Creating the electronic version of the test takes the teacher as long as creating the printed version. Unlike the printed version, the electronic version can be used repeatedly, and in different forms. The electronic test was used repeatedly during class, allowing the teacher to see the student's skills and knowledge improve in real time. This, however, will be the subject of further research.

## REFERENCES

- ISTE, 2017. ISTE Standards for Educators. ISTE Standards for Students. Qtd. 19. 11. 2017, available at: <https://www.iste.org/standards>.
- Kargerová, J., Maňourová, Z., 2013. *Individualization in instruction*. Step by Step ČR, Prague.
- Kasíková, H., Dittrich, P., Valenta, J., 2007. *Individualization and Differentiation in School*. In Vališová A., Kasíková, H., et al. *Pedagogy for Teachers*. Grada Publishing, Prague.
- Klupal, L., Kostolányová, K. a Gybas, V. Using Tablet and Itunesu as Individualized Instruction Tools. In: *Mobile Learning 2017: Proceedings of the 13th international conference mobile learning 2017* 2017 Budapest, Hungary. Budapest, Hungary: IADIS Press, 2017. s. 139-142. ISBN 978-989-8533-61-6.
- Klupal, L. & Kostolanyova, K. 2015, "Practicing in mathematics using a tablet", *Proceedings of the European Conference on e-Learning, ECEL*, pp. 712.
- Mobile Learning Toolit, 2012. iPAC Framework. Qtd. 28. 11. 2017, available at: <http://www.mobilelearningtoolkit.com/ipac-framework.html>
- MŠMT, 2017. Framework Education Program for Basic Education. Qtd. 19. 11. 2017, available at: <http://www.msmt.cz/file/43792/>.
- Prexťová, T., 2016. *Adaptation of Testing: Yes or no?*. In European Conference on e-Learning: Proceedings of the 15th European Conference on e-Learning ECEL. ACPI, Prague.
- Prexťová, T., 2017. *Adapt or not adapt the testing process*. In Media4u Magazine. ISSN 1214-9187.
- Vališová, A., Kasíková, H., 2011. *Pedagogy for Teachers – 2<sup>nd</sup> Edition, Extended and Updated*. Grada Publishing, Prague.
- Průcha, J., Walterová, E., Mareš, J., 2013. *Pedagogical Dictionary. 7<sup>th</sup> Edition, Extended and Updated*. Portál, Prague ISBN 978-80-262-0403-9.